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AUTHOR Biller, Jerry
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ABSTRACT

This paper describes the "Make-A-Problem" activity through which students can reframe their attitudes toward mathematics by putting art into the mathematics class. "Make-A-Problem" contains three sections: (1) problem--the student creates a problem dealing with a specific concept assigned by the instructor; (2) picture--an artistic interpretation of the problem/concept is included in this area; and (3) solution--the problem formulated by the student is solved. Drawing the picture allows the students to put the concept into perspective (a schema) and results in increased comprehension. This approach allows for the lessening of mathematics anxiety and increased learning on the part of the students. (EH)

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A CREATIVE CONCEPT IN TEACHING MATH TO ART STUDENTS:

Make-A-Problem

Jerry Biller
Ringling School of Art and Design
Sarasota, Florida

Tell me and I forget.
Show me and I remember.
Involve me and I understand.

Confucius

Learning environments which offer the student an opportunity to involve themselves in unique problem solving activities such as the Make-A-Problem, allow them to obtain a sense of ownership and control in their learning process. Accentuating the freedom to individually design mathematical representations through focus on their respective backgrounds validates the importance of their prior knowledge. The student reviews past experiences through "mathematical eyes" which are now combined with the right-brained skills of an artist.

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> A mathematician is a maker of patterns . . . . His patterns, like the painter's or the poet's, must be beautiful; the ideas, like the colors or the words, must fit together in a harmonious way. Beauty is the final test. There is no permanent place in the world for ugly mathematics.
>
> G. H. Hardy

Make-A-Problem is an activity through which to change a student's state of mind and reframe their attitude toward math by putting art into their math class.

Students learn best when they are challenged. It is the instructor's "role to provide stimulating problems and environment to motivate mathematical learning" (U.S. Department of Education, 1993). In the past, educators lectured, telling and showing how to work problems. Few involved the student in the learning process. "Teaching as telling" can no longer be the operative form of instruction in mathematics classrooms. Instead, multiple opportunities must be provided for students to engage with mathematics (Merseth, 1993). The role of an educator in the '90s and beyond is constantly to challenge, motivate, and educate the student. The process involved in constructing a personal interpretation of a math concept through application of artistic reference is a critical skill. As Einstein said, "The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill."

Traditionally, students have been conditioned to focus on the "right answer." The assessment techniques and tools developed throughout the years have had a continual narrowing of focus on the problem solving process. Today, conservation of time and materials has promoted the development of assessment tools which need only be bubbled in. The right answer should not be an end point. Questions should serve as the medium through which other thought processes are stimulated. The California Math Council stated, "To reform mathematics learning, we need assessment instruments that measure student's ability to make sense of complex situations, to formulate and refine hypotheses, to work with poorly defined problems or problems with more than one solution, and to define and state problems" (California State Department of Education, 1989). The Educational Policies Commission defined the central purpose of American education as that "which runs through and strengthens all other educational purposes. The common thread of education - is the development of the ability to think" (Shane, 1981). The techniques used in Make-A-Problem address the need of extending and strengthening mathematical content and concepts.

Make-A-Problem (Figure 1) contains three sections: 1) PROBLEM - the student must make up a problem that deals with the specific concept that is assigned by the

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instructor, 2) PICTURE - an artistic interpretation of the problem/concept is included in this area, and 3) SOLUTION - the problem that the student formulated in the first section of this form is solved. The student uses problems in their textbook as examples to make their own structured problems. Drawing the picture allows the student to put the concept into their own perspective (schema) and results in inceased comprehension. "Students who construct their own mathematical understanding transform their mathematical potential" (U.S. Department of Education). "As learners learn, they store knowledge in clusters and organize these clusters into schemata, so that all learning depends on prior knowledge" (Merseth). Students need to relate their learning to everyday life and understand how it can be used in their respective careers. They need reasoning abilities along with factual knowledge to handle their personal and business affairs.

The structure of curriculum and the classroom environment created by the instructor should encompass the needs of the student. It is not uncommon for the art student to experience high anxiety when involved in mathematical tasks. The traditional mathematics classroom fails to establish a comfort zone for these students. In a study of art students, Judith Katz describes them as intuitively different from those at liberal arts colleges. She notes that they like short term independent projects and enjoy assignments that allow creativity and imagination.

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By bringing art into mathematics assignments, Make-A-Problem targets this learning style and adds the element of comfort. This in turn serves to reduce anxiety. This is confirmed through the questionnaires that students receive at the beginning and end of each course (Figure 2). One hundred percent (100%) of the comments reflect a positive change in attitude toward mathematics after completion of the course.

The year 2000 will bring with it the opportunity for improving the learning experiences of all students. Of primary concern are the classroom environment and curriculum structure. Both must provide the student with opportunities that expose them to the relationship between learning and living (Shane). Courses that fall outside the realm of natural interest for a student must include the necessary steps to incorporate that interest into coursework, just as Make-A-Problem integrates art into the math assignments. Art students need to leave the classroom with a positive attitude, open mind, and better understanding of mathematics.

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Figure Example 1. Make-A-Problem form.

MAKE-A-PROBLEM

CHAPTER/SECTION_____ NAME_____
MAJOR_____ DATE_____
TOPIC_____ COURSE_____

PROBLEM _____

PICTURE _____

SOLUTION _____

Figure Example 2. Make-A-Problem Questionnaire.

Make-A-Problem QUESTIONNAIRE

Name_____
Date_____
Course_____

1. Do you experience anxiety toward math?

2. Does the Make-A-Problem activity reduce any anxiety you have toward math?

3. Does the Make-A-Problem activity increase your understanding of the topics covered?

Comments:

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